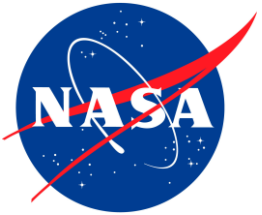


Combined polarimetric Doppler radar and satellite scatterometer observations of organized convection near coastal regions



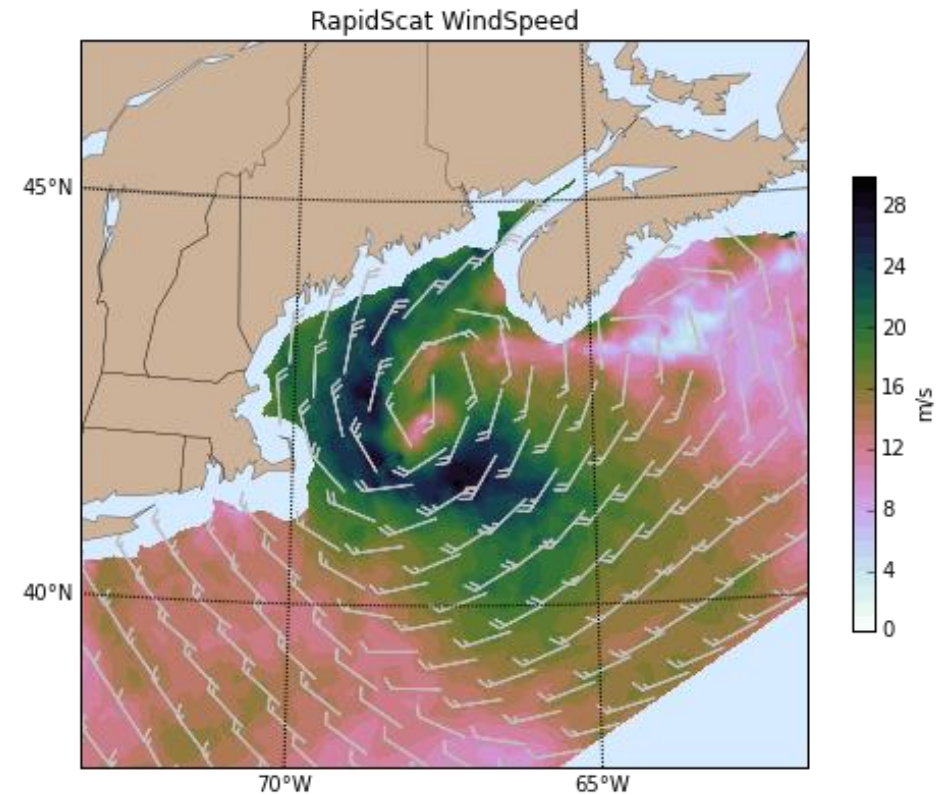
Timothy Lang



George Priftis, Themis Chronis



Piyush Garg, Steve Nesbitt

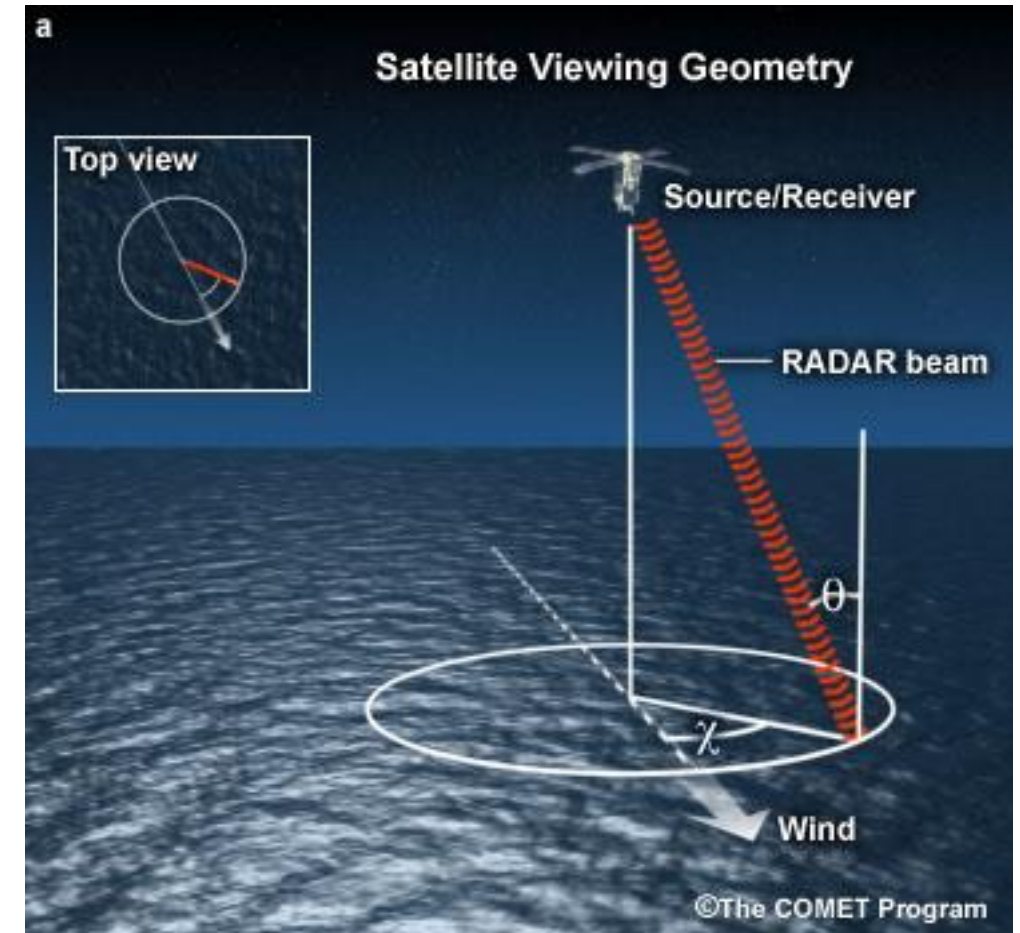


Background

- Scatterometers are radars on satellites that scan the ocean surface at multiple look angles
- Retrieve wind speed and direction via empirical relationships (geophysical model functions) linked to ocean surface state (mean square slope)
- Typically Ku- (e.g., QuikSCAT, RapidScat) or C-band (e.g., ASCAT) - subject to attenuation by rainfall, or spoofing by raindrop-induced surface capillary waves

Our Scientific Questions

- Given limitations of scatterometers in raining areas, how can we best use them to understand near-surface winds in and near organized convective systems?
- What is the value added by combining scatterometry with polarimetric Doppler radars near coastlines/islands?
- Can we identify significant surface wind features (e.g., in/outflow, boundaries, jets, etc.) that may be responsible for organizing convective systems?

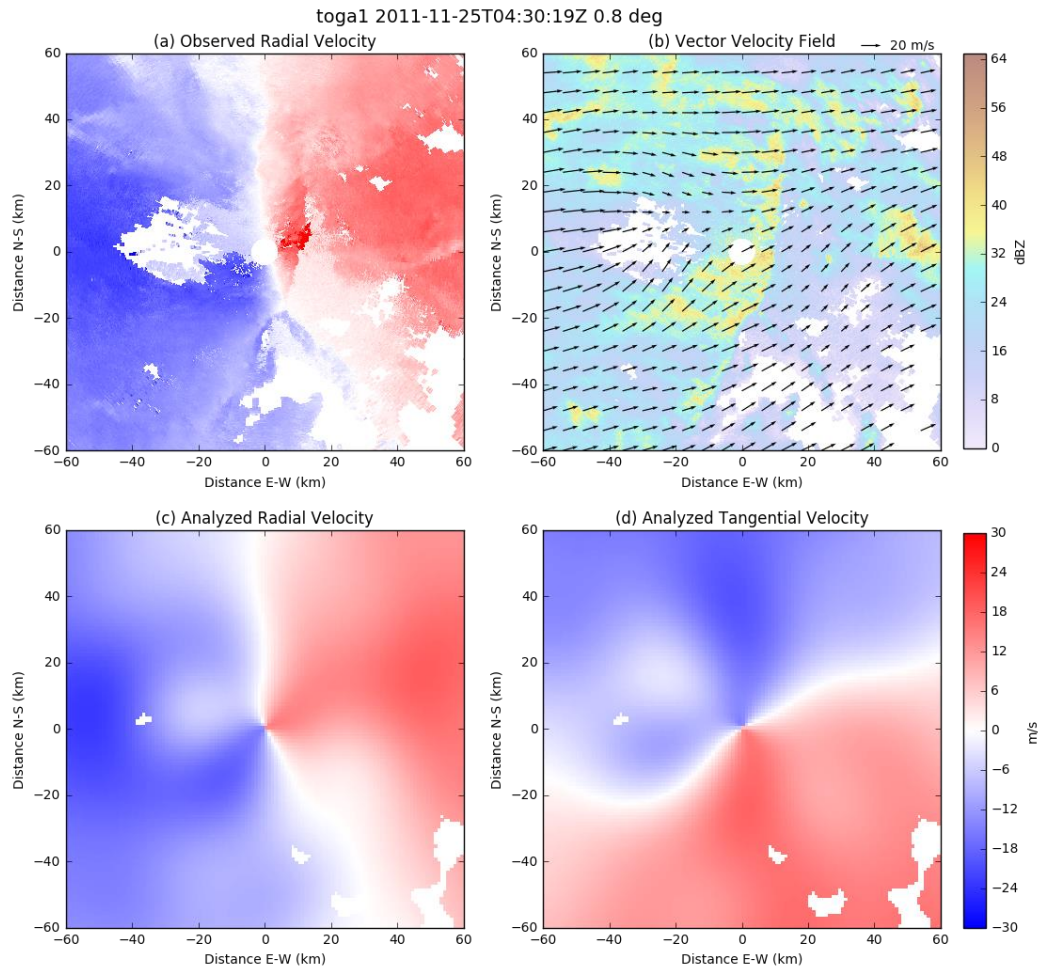


www.goes-r.gov (COMET module)

SingleDop

<https://github.com/nasa/SingleDop>

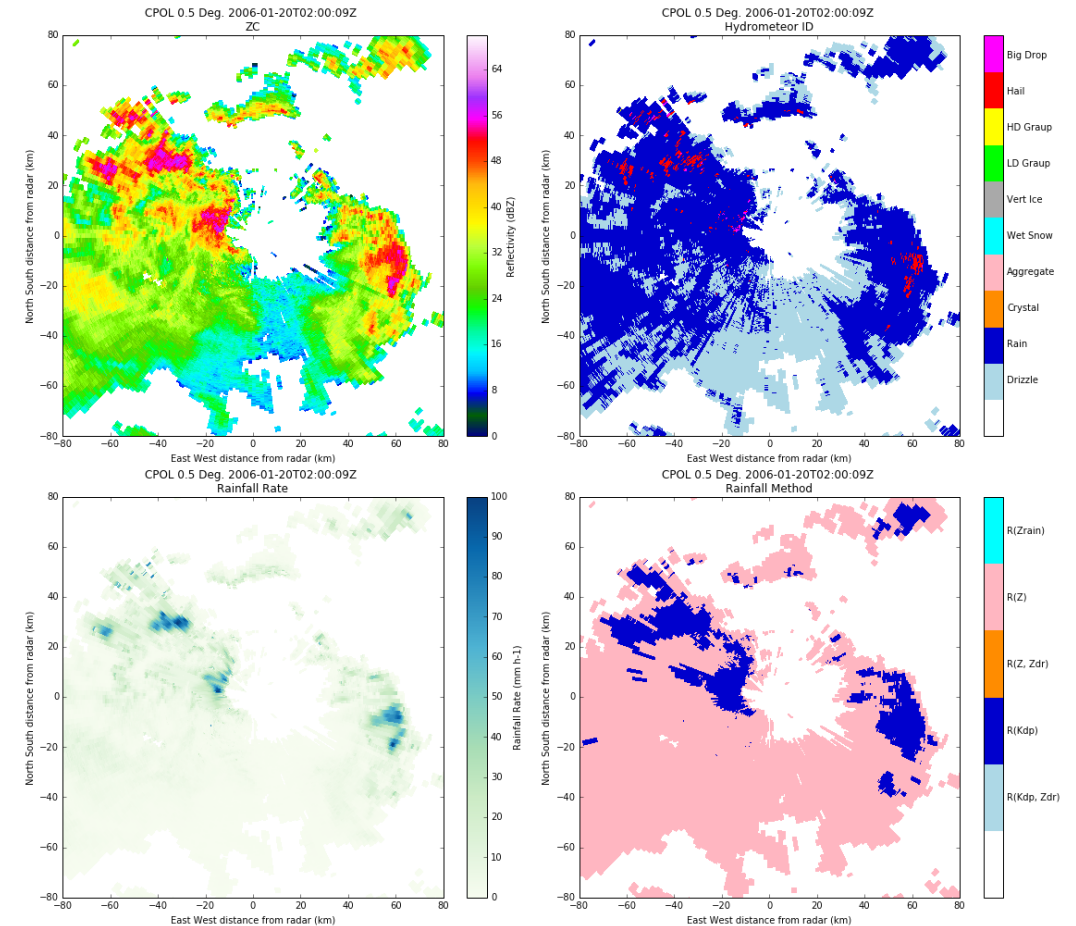
- Single-Doppler retrievals of low-level 2D winds on conical PPI sweep
- Based on Xu et al. (2006) 2DVAR algorithm



DualPol

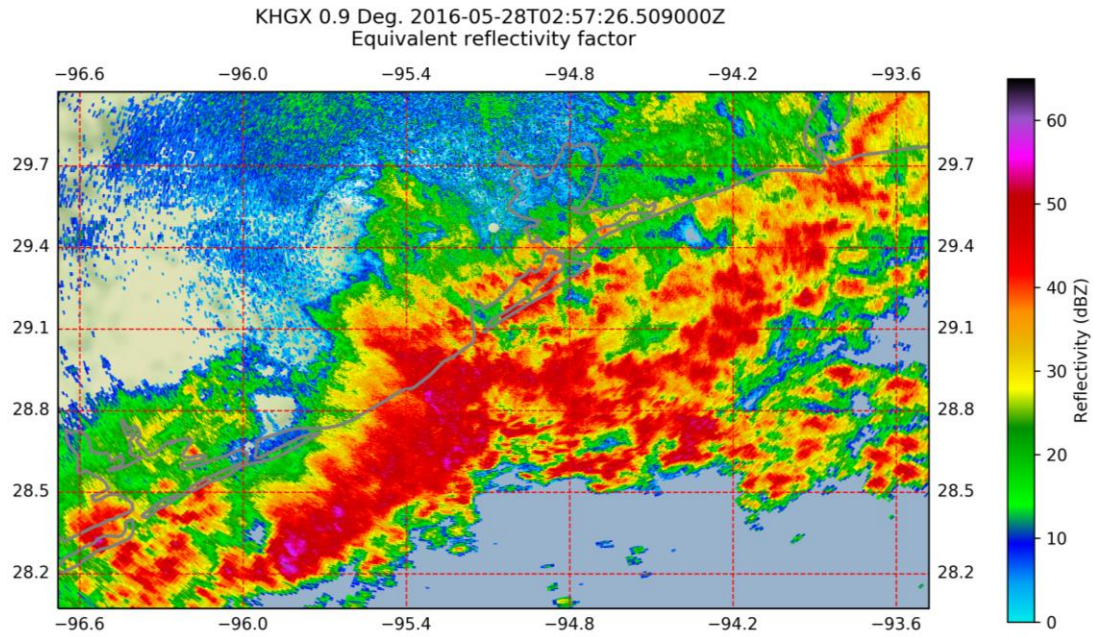
<https://github.com/nasa/DualPol>

- Dual-pol retrievals from arbitrary radar, including rain, DSD, LWC/IWC, HID, etc.
- Based on CSU algorithm heritage (e.g., Bringi, Chandra, Carey, Cifelli, Dolan, Lang)

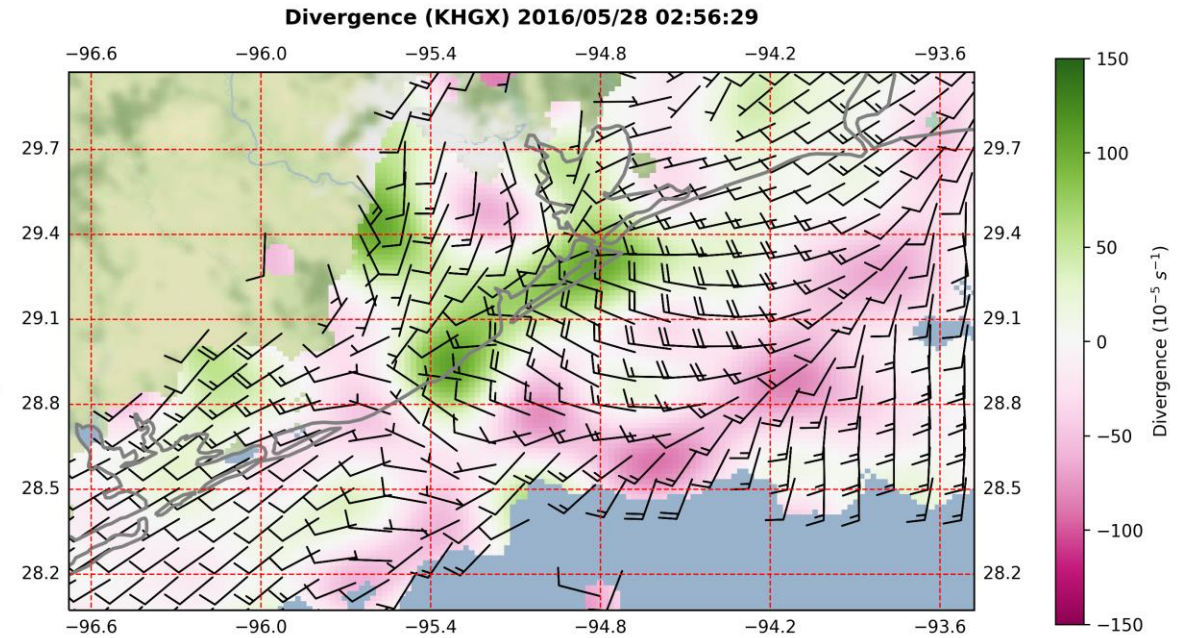
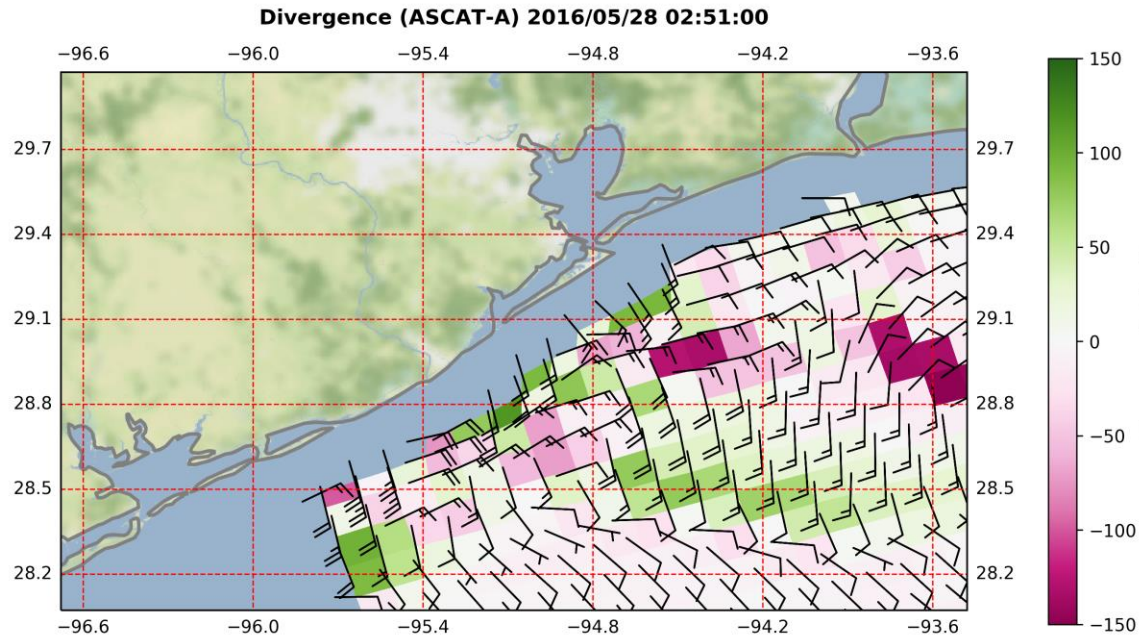
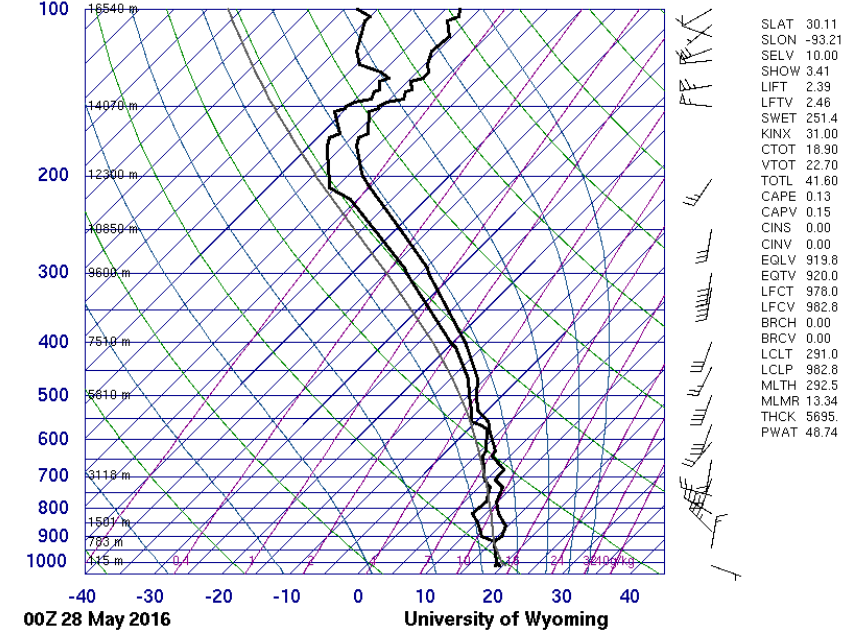


Also – Py-ART, CSU_RadarTools, pyresample, etc.

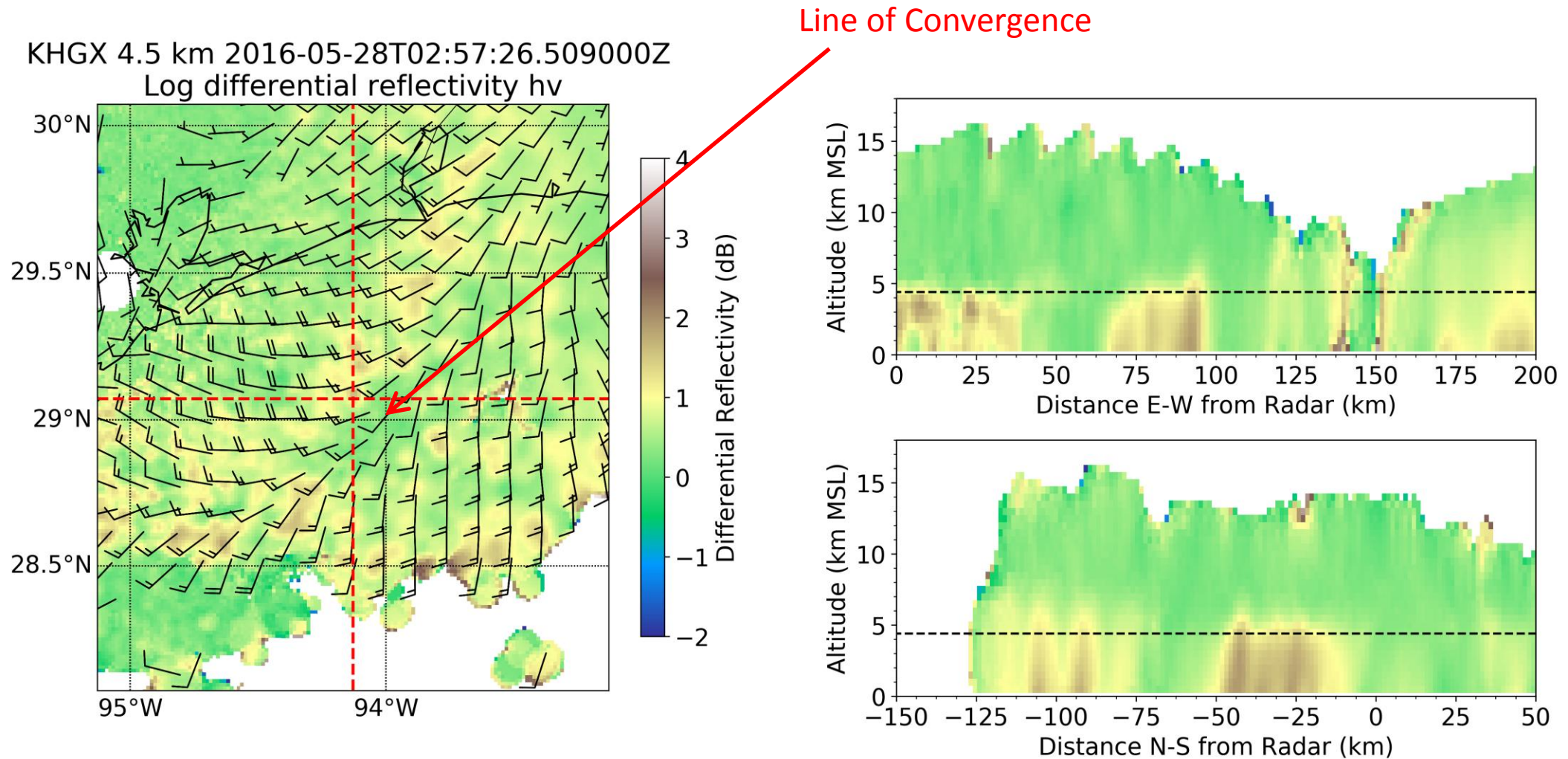
5/28/2016
Houston



72240 LCH Lake Charles

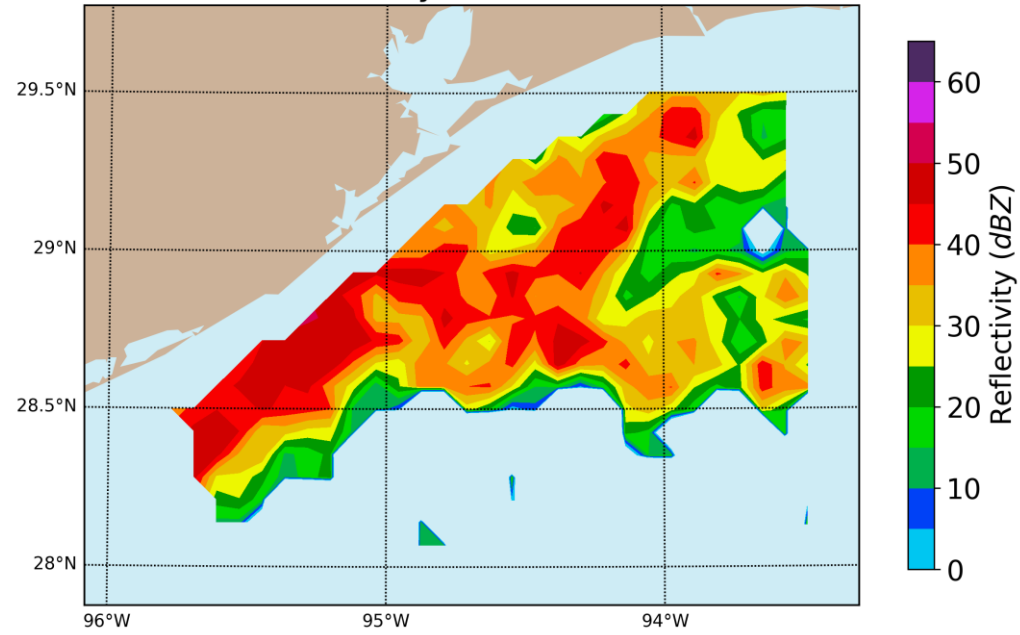


ZDR and SingleDop Winds

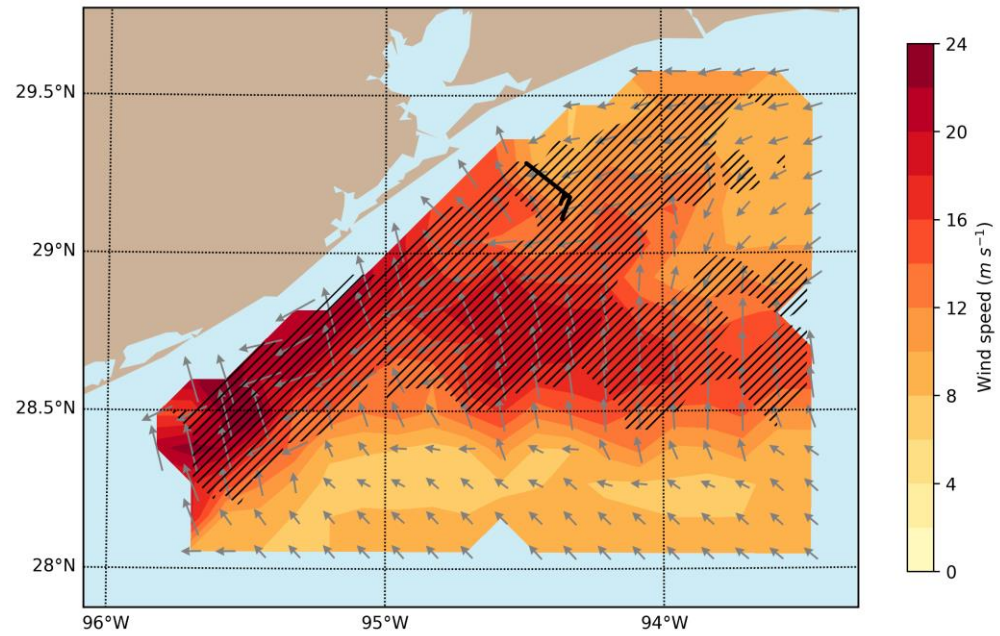


ZDR columns reside just rearward of low-level convergence

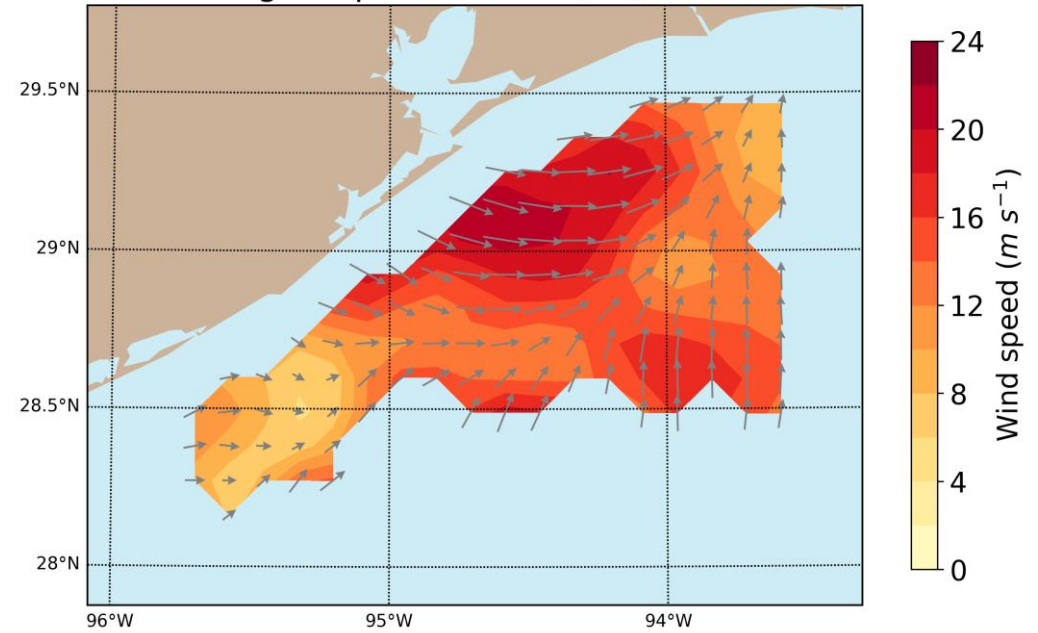
KHGX Reflectivity 2016/05/28 02:56:28



ASCAT-A Winds 2016/05/28 02:51:00

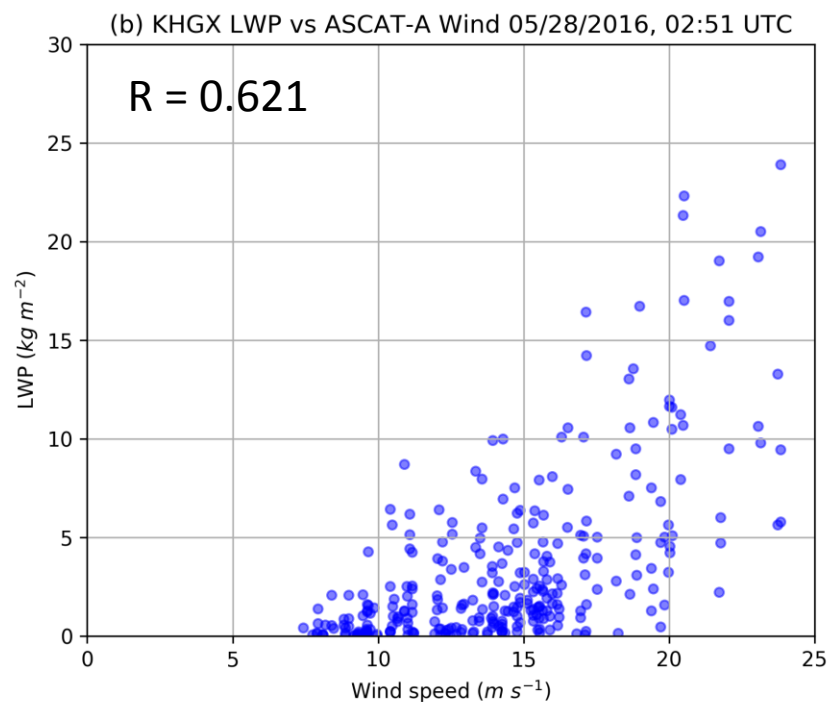
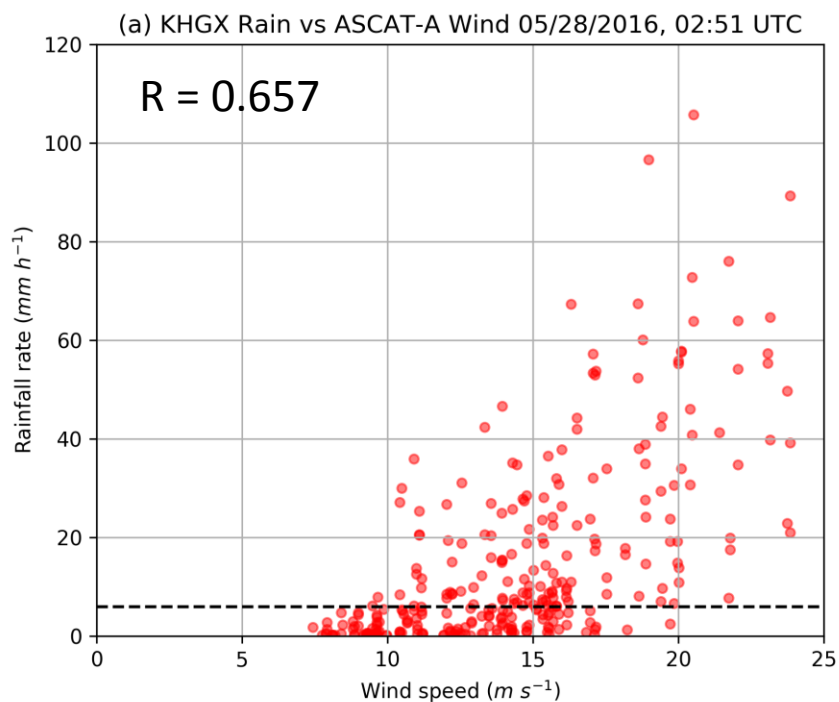


KHGX SingleDop Winds 2016/05/28 02:56:28



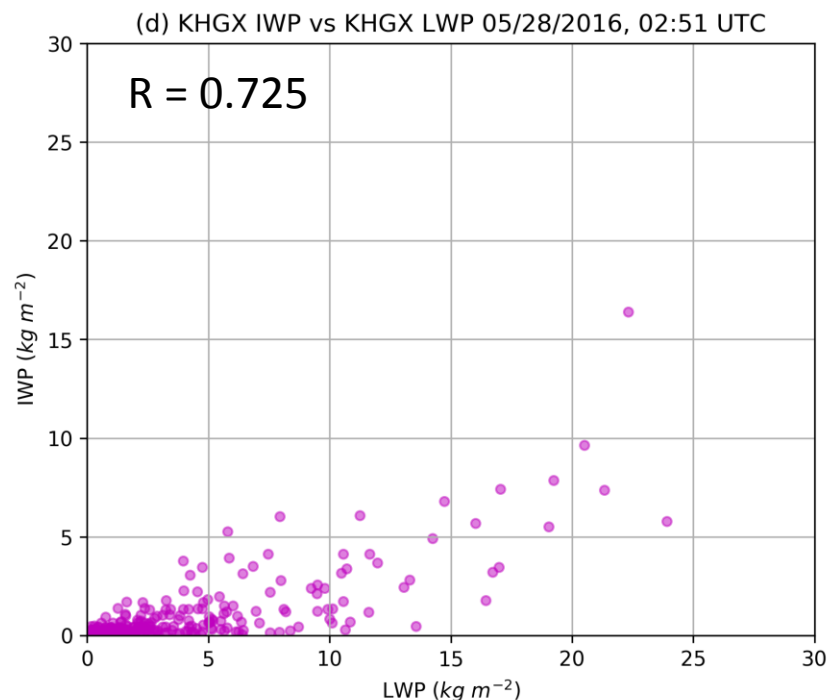
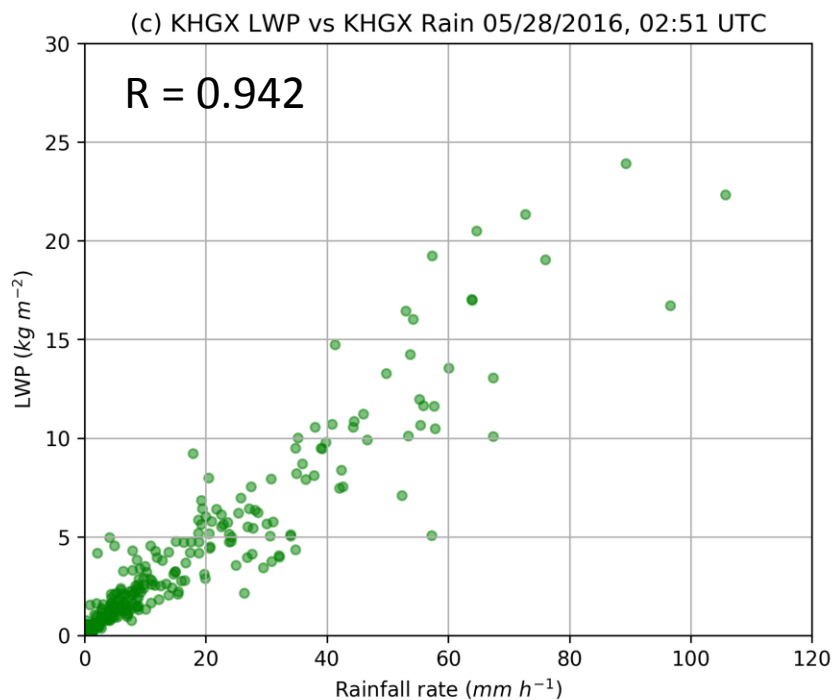
Resampled to 12.5-km

KHGX Rain vs. ASCAT-A Wind



KHGX LWP vs. ASCAT-A Wind

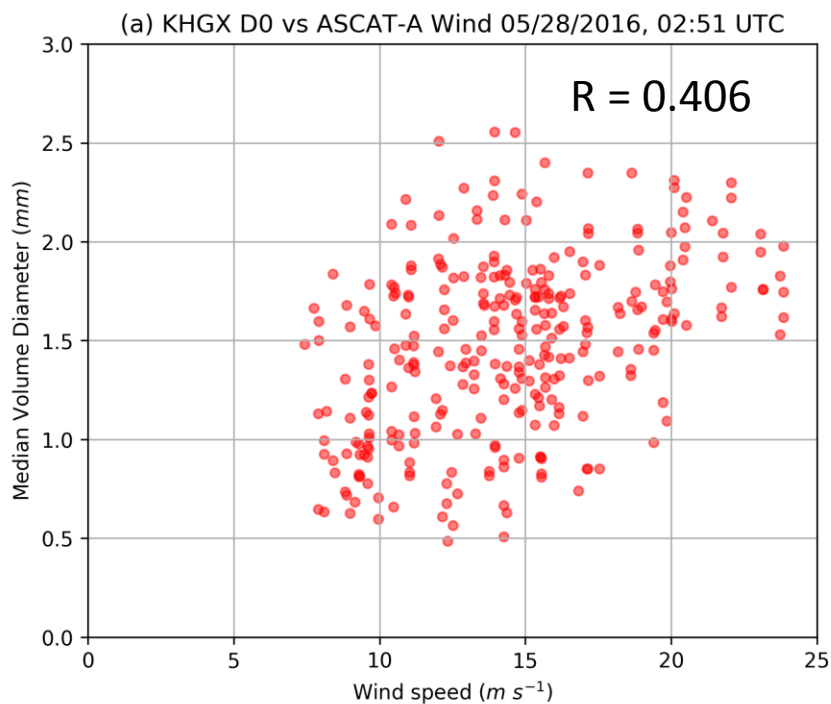
KHGX LWP vs. KHGX Rain



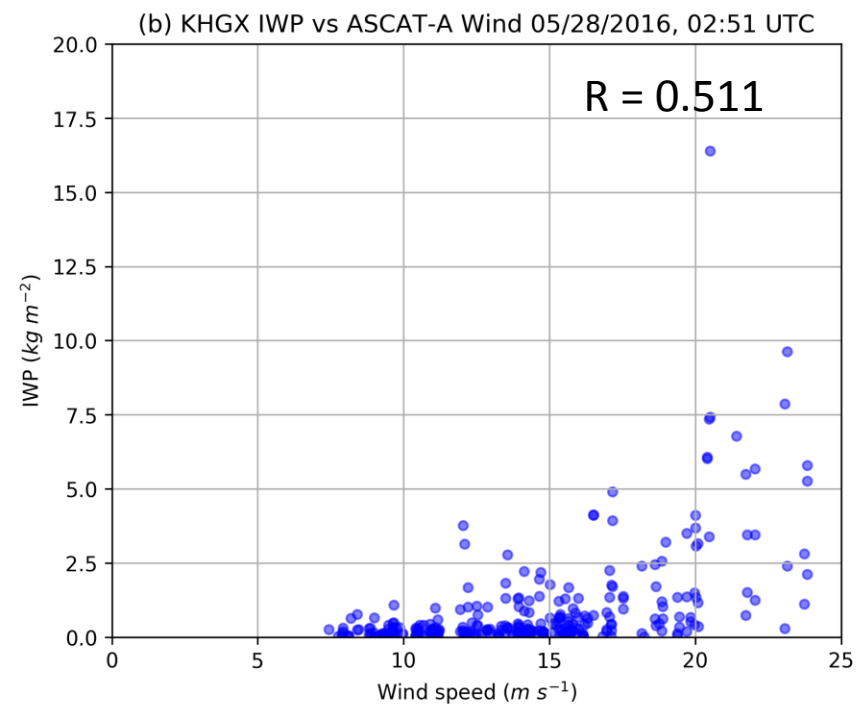
KHGX IWP vs. KHGX LWP

Resampled to 12.5-km

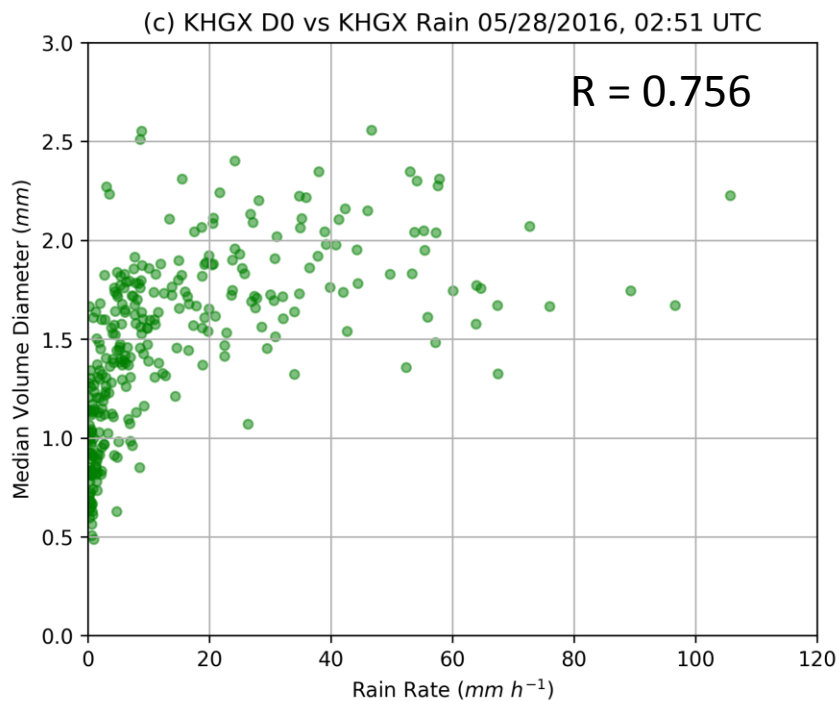
KHGX D_0 vs. ASCAT-A



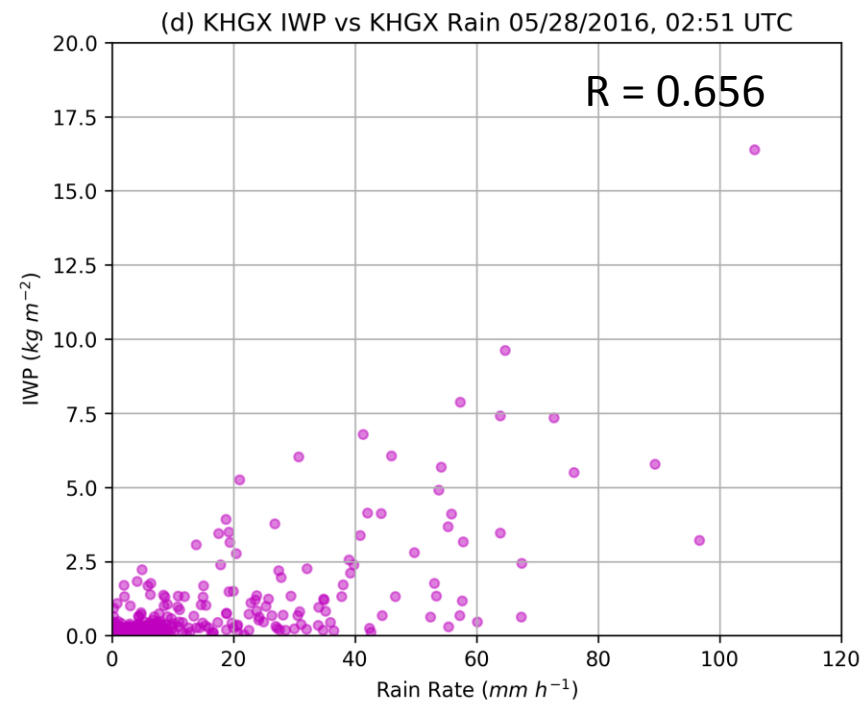
KHGX IWP vs. ASCAT-A



KHGX D_0 vs. Rain

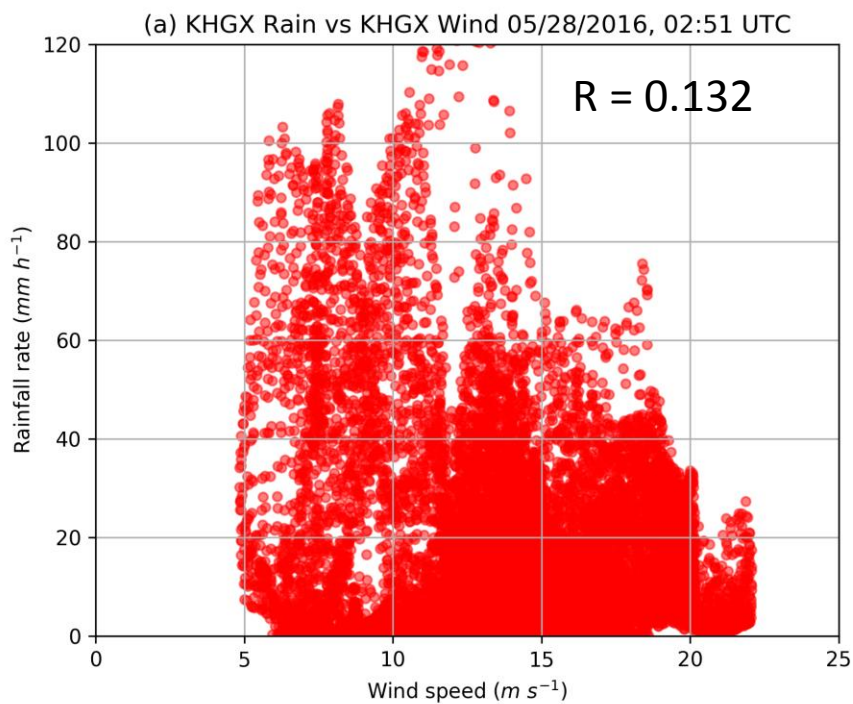


KHGX IWP vs. Rain

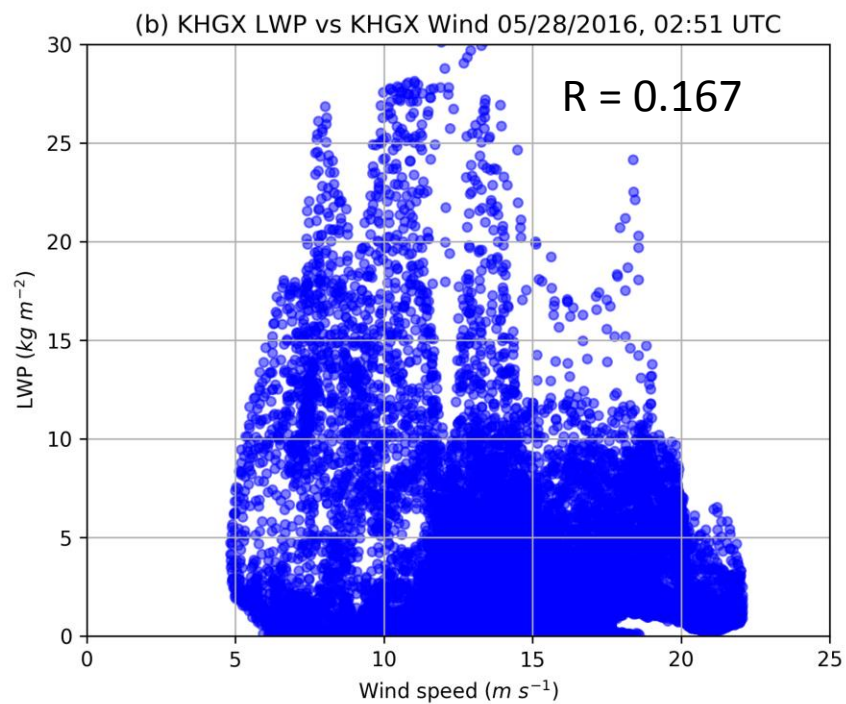


Resampled to 2-km

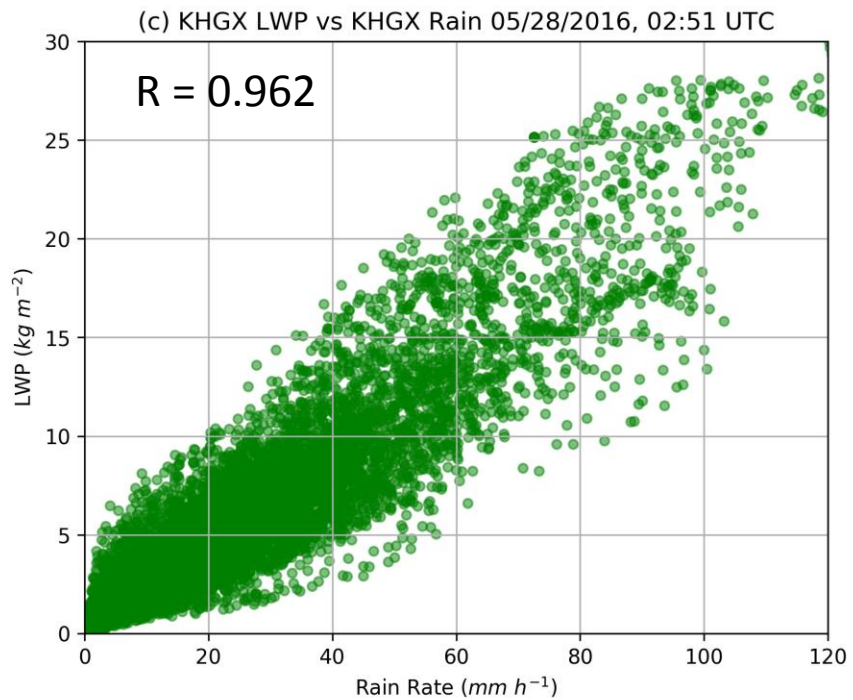
KHGX Rain vs. KHGX Wind



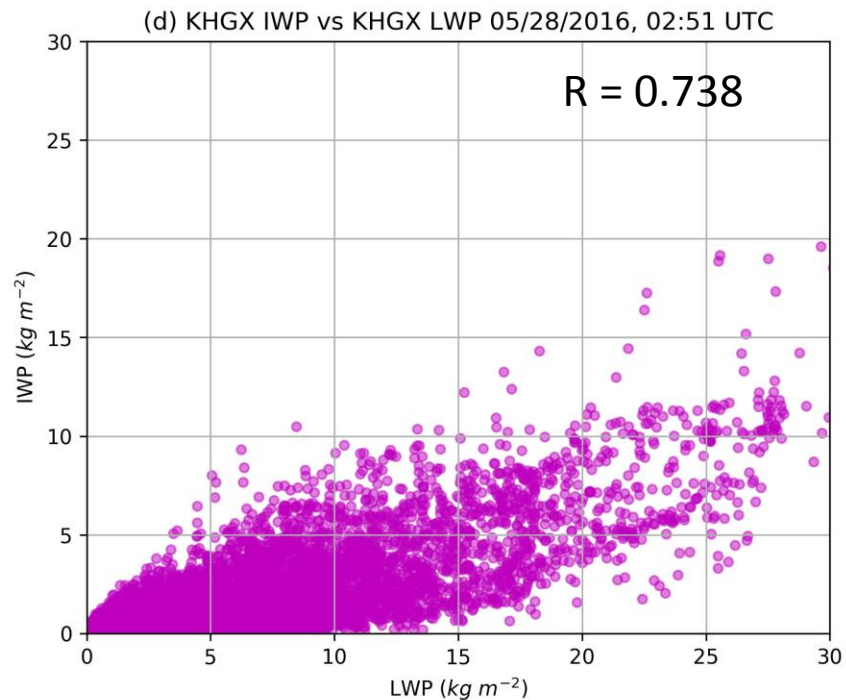
KHGX LWP vs. KHGX Wind



KHGX LWP vs. KHGX Rain



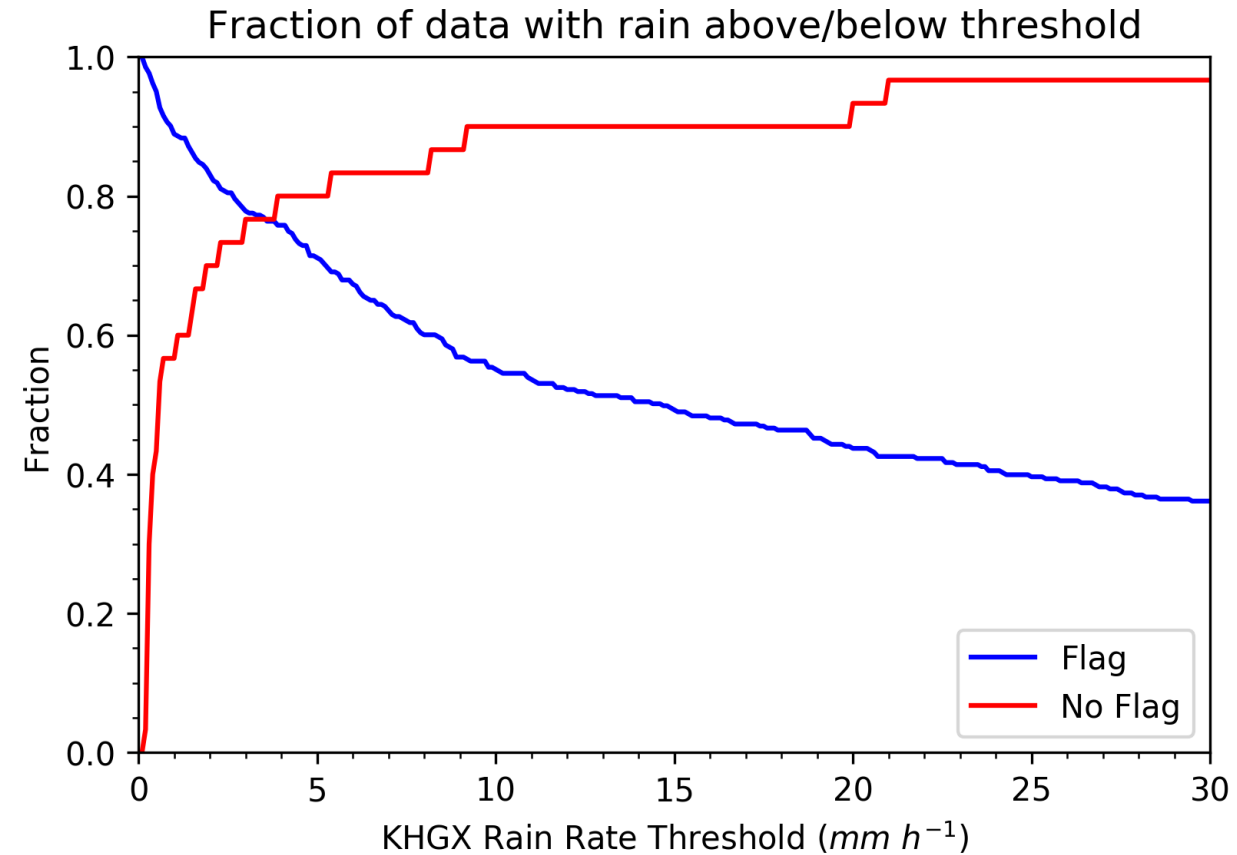
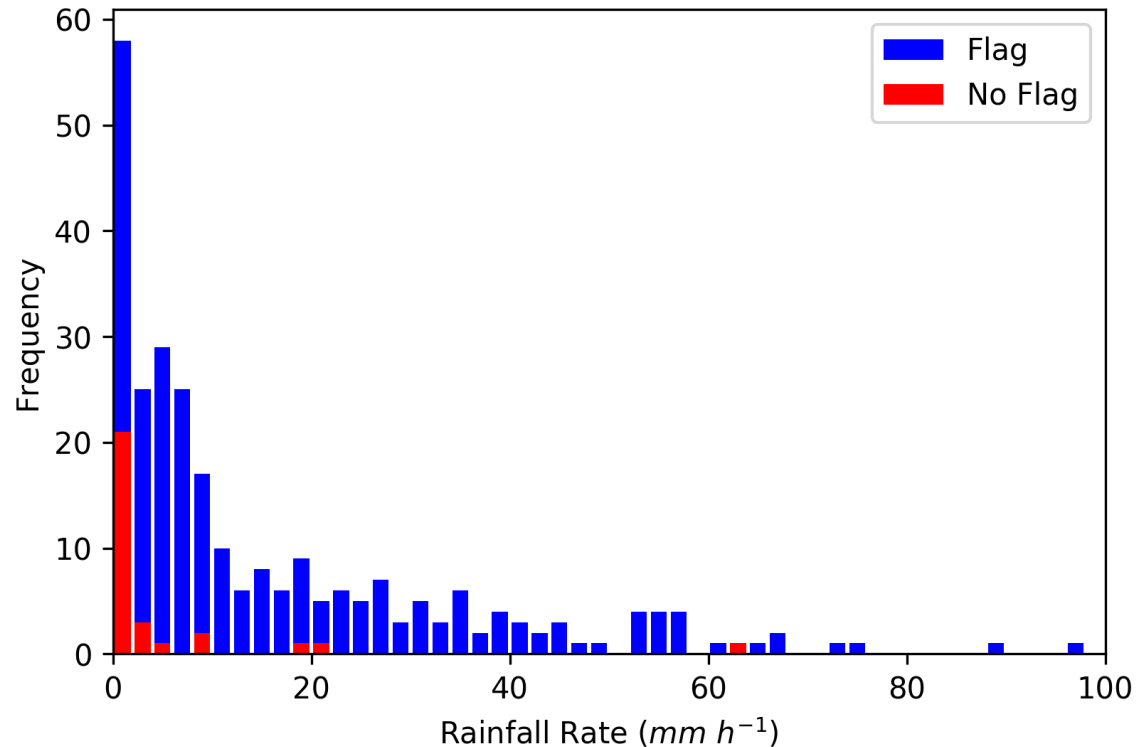
KHGX IWP vs. KHGX LWP

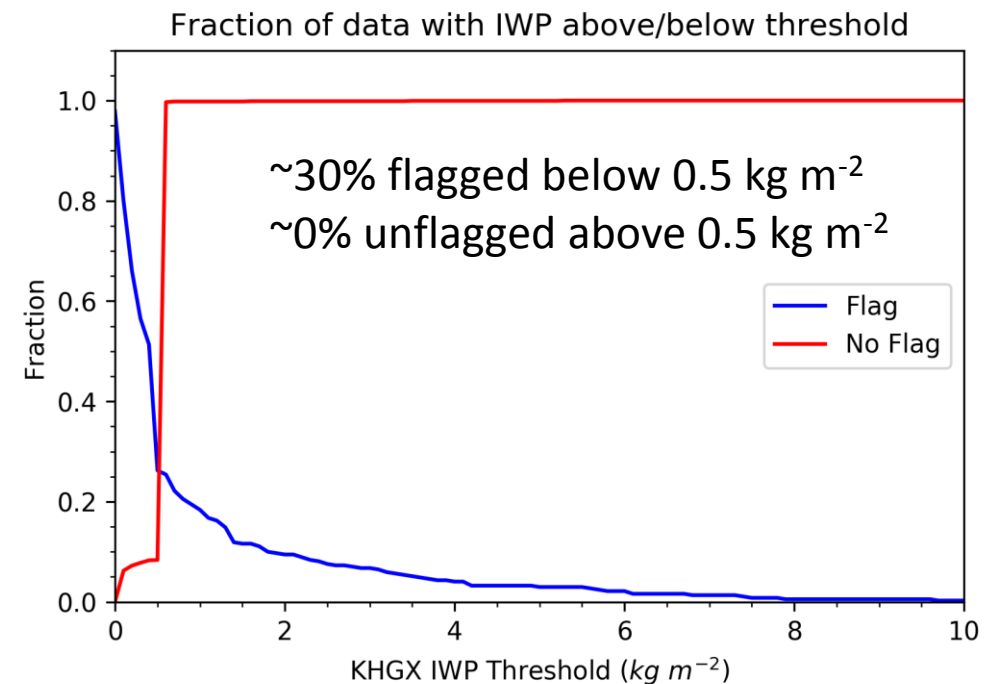
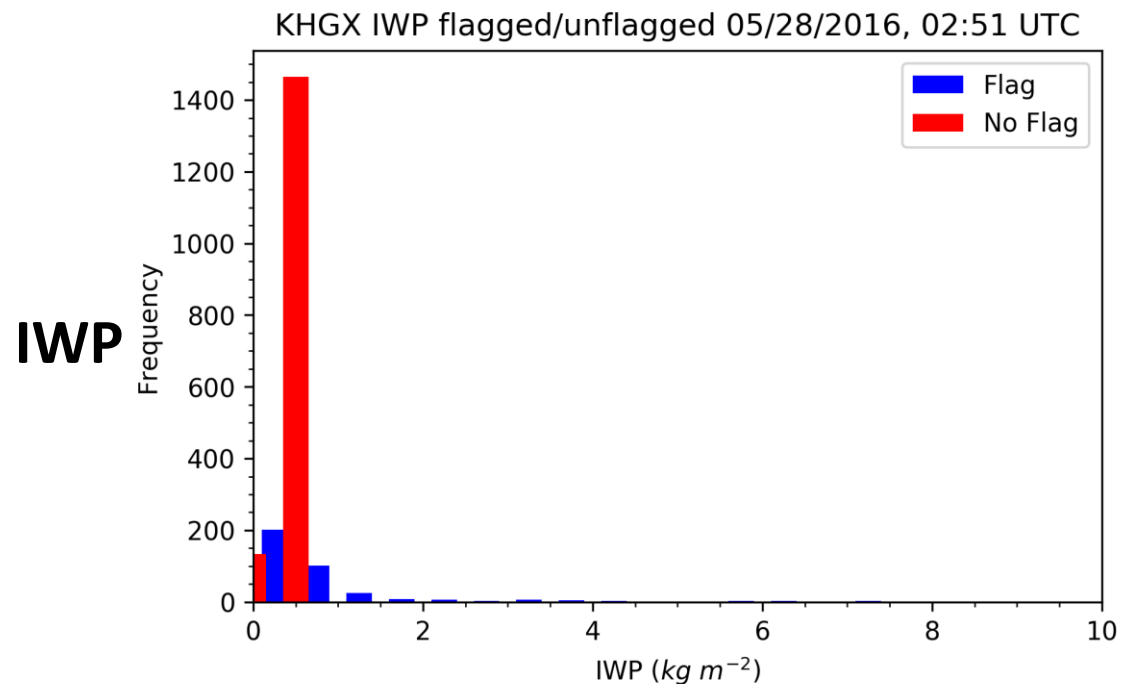
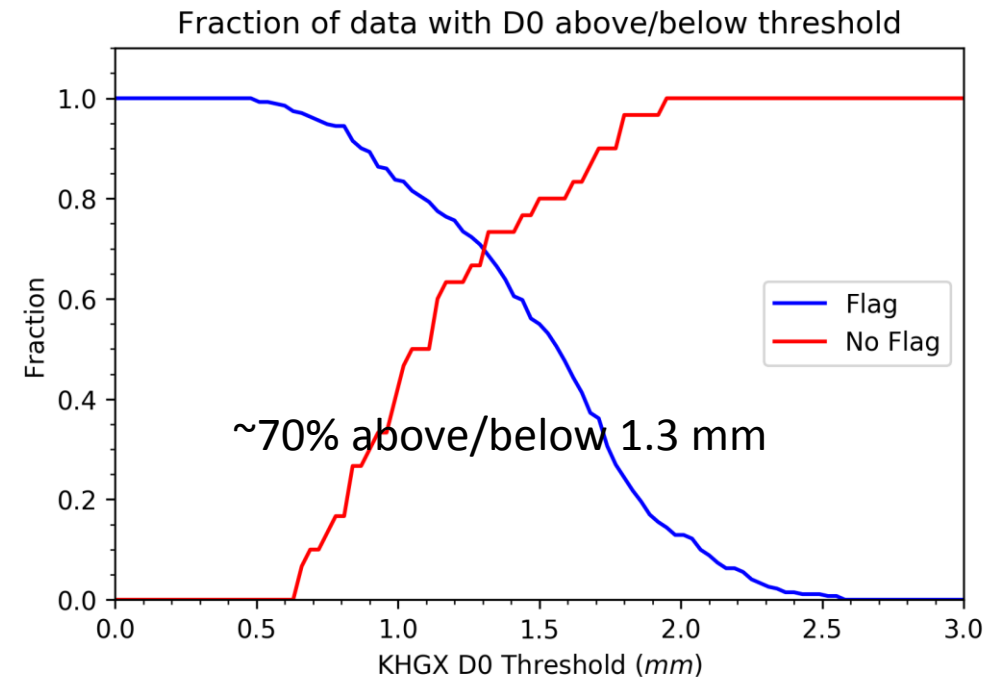
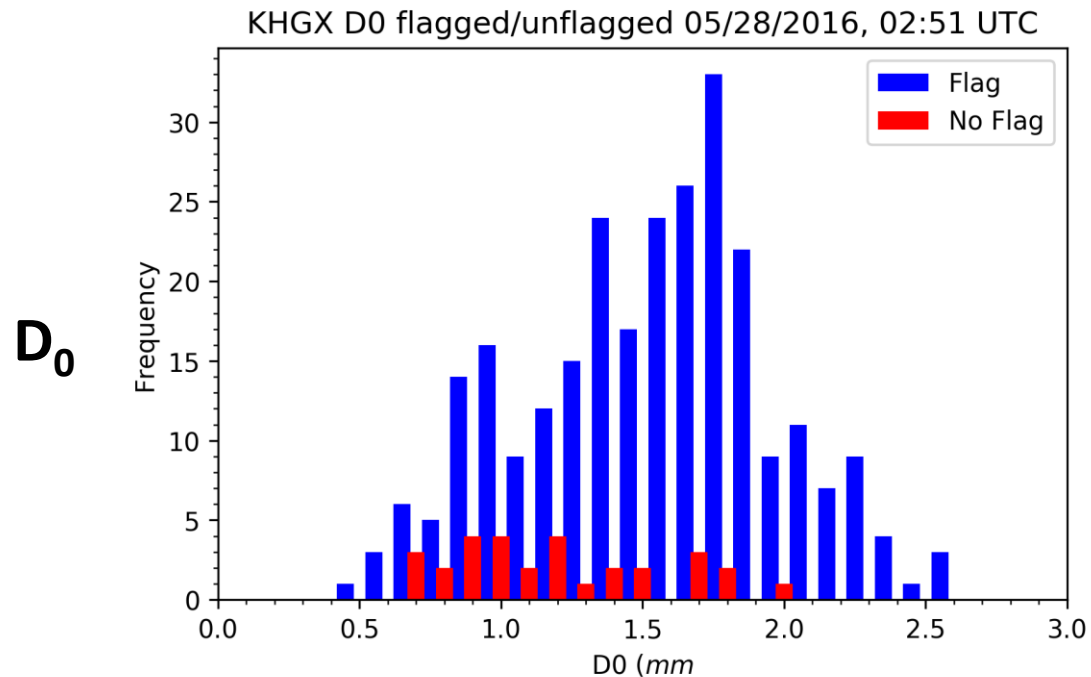


At a threshold of 3 mm h⁻¹:

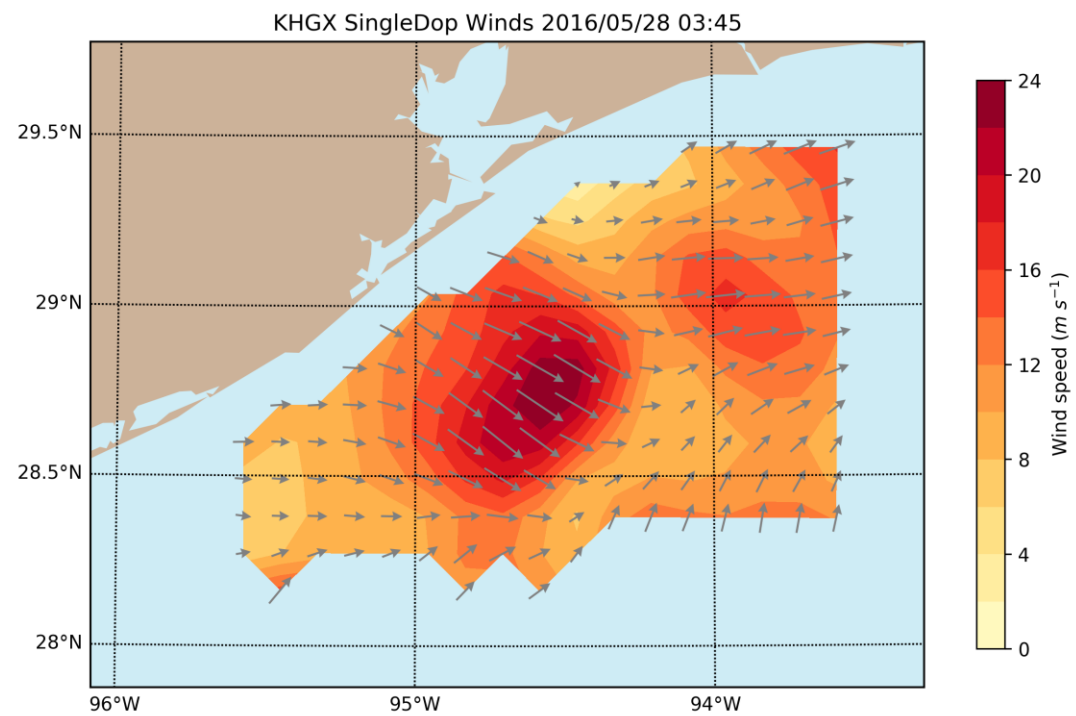
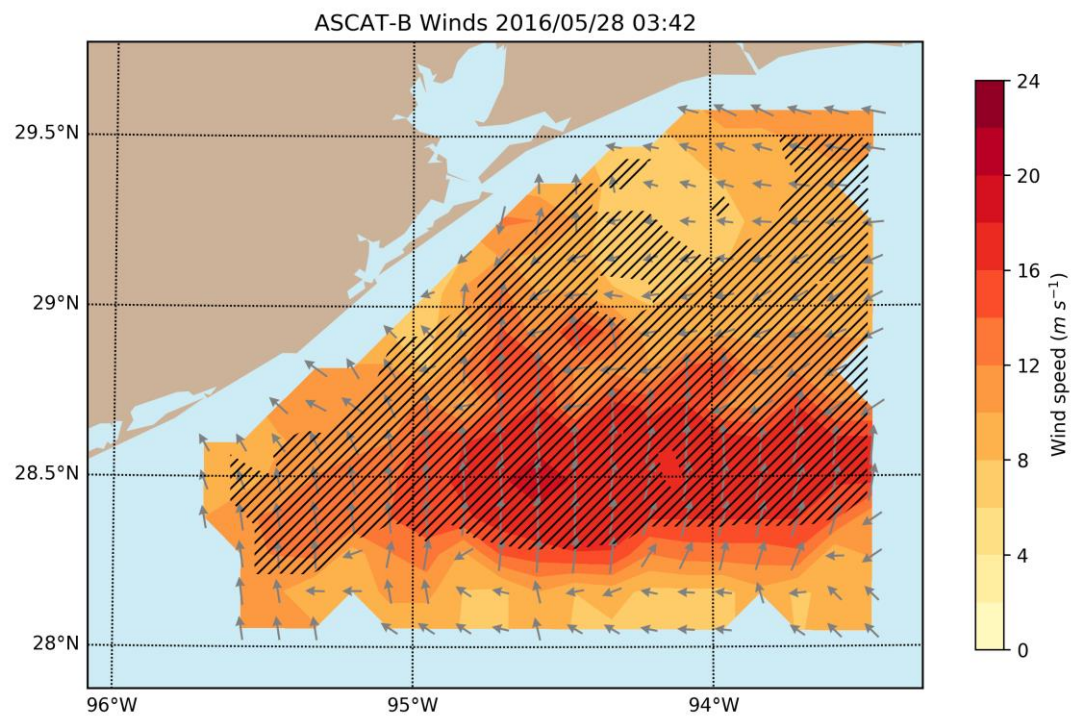
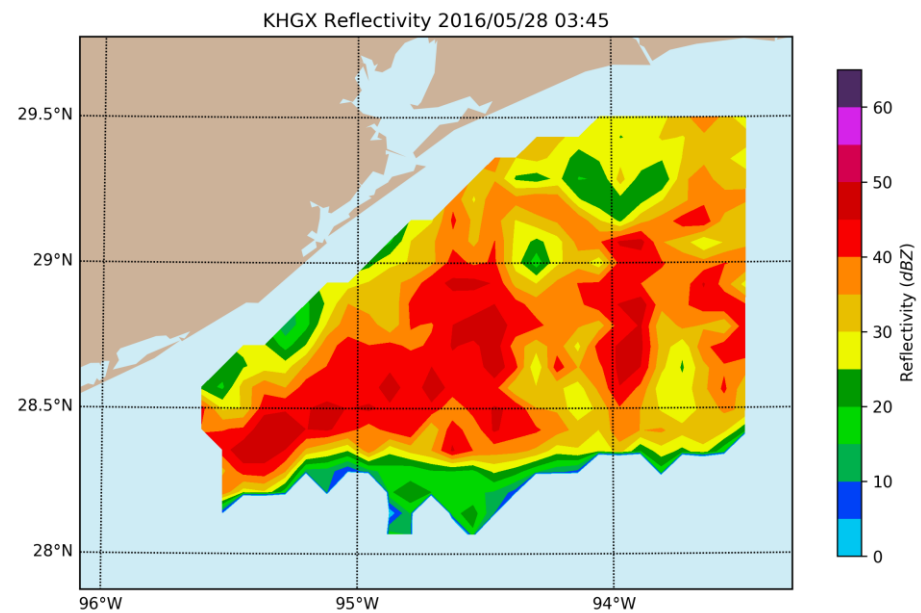
- ~75% of flagged data are above
- ~75% of unflagged data are below

Density function of KHGX Rainfall flagged/unflagged 05/28/2016, 02:5

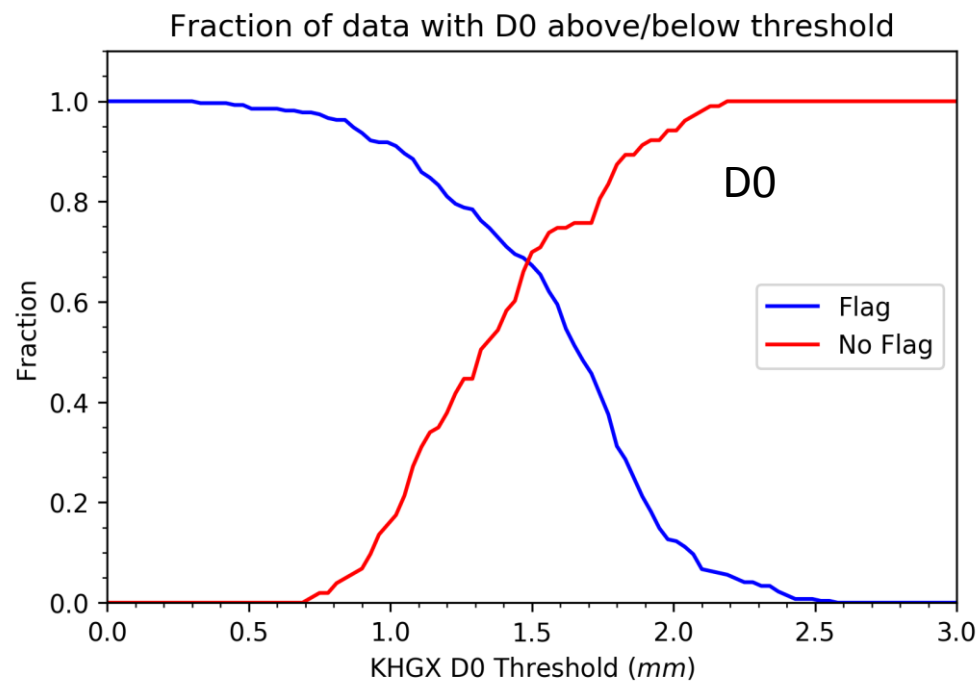
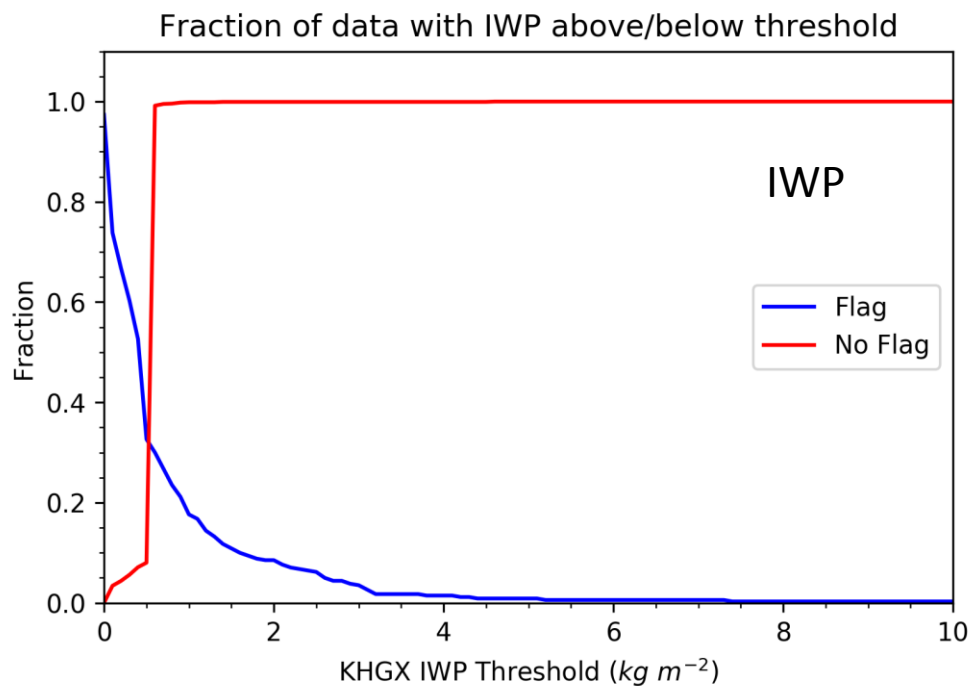
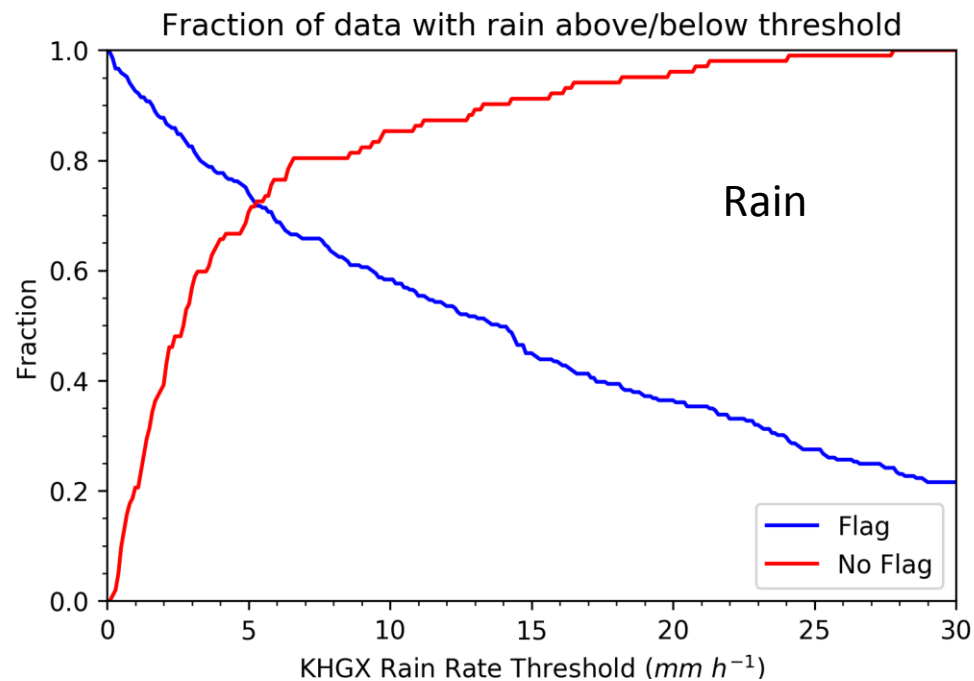
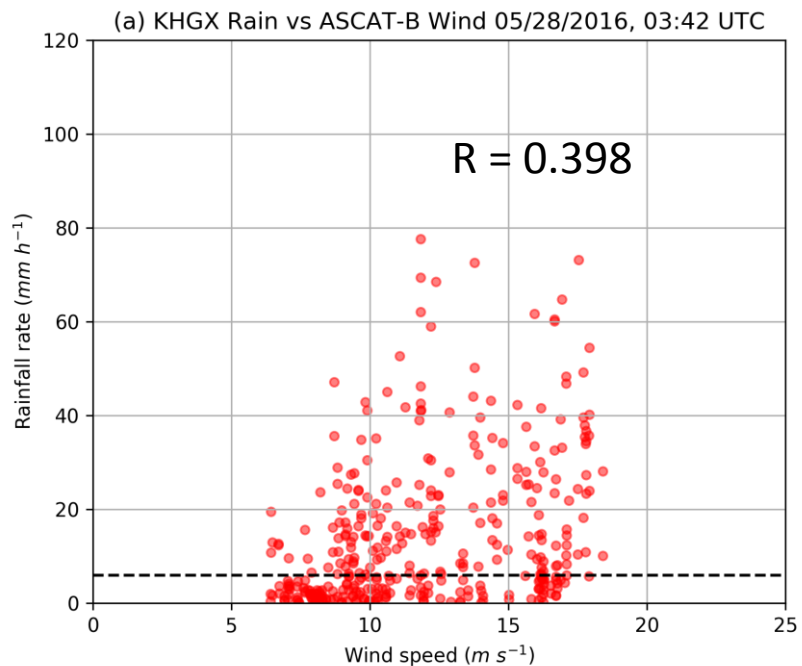




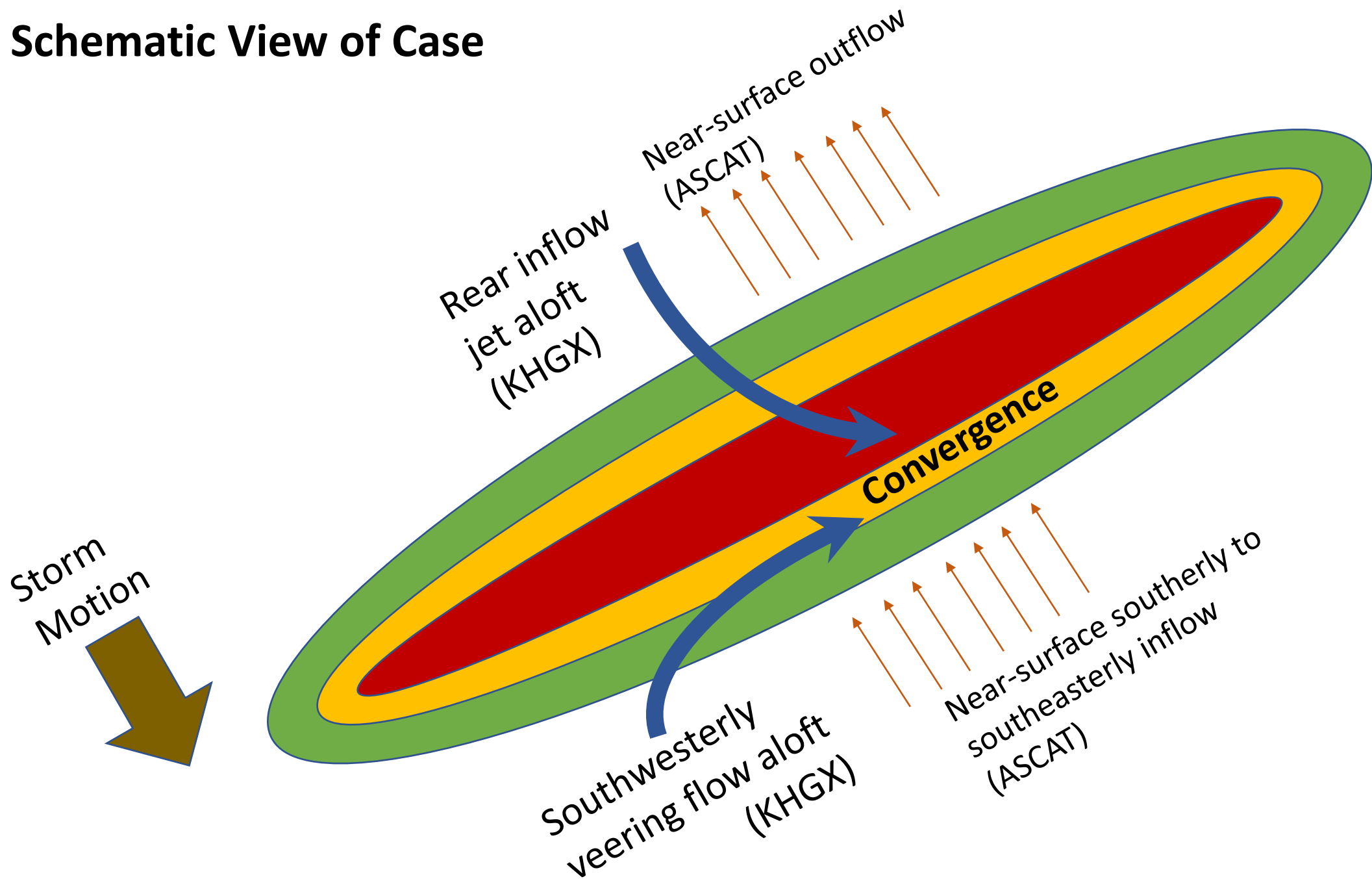
ASCAT-B Overpass 0342 UTC



KHGX Rain vs. ASCAT-B Wind

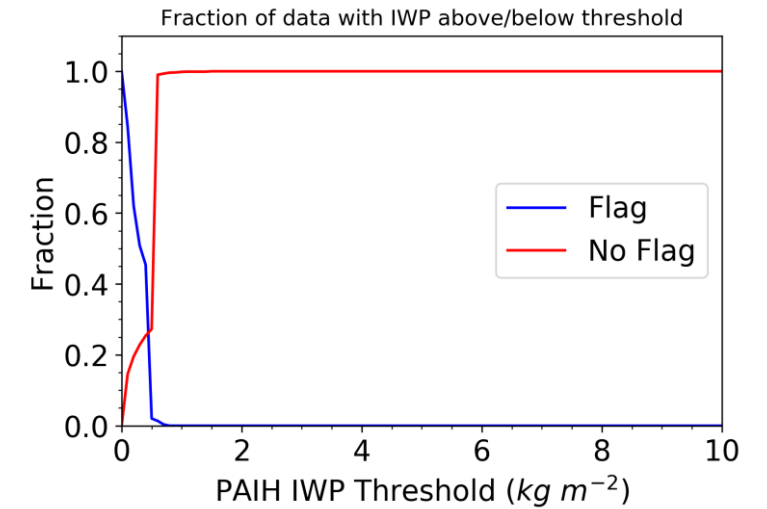
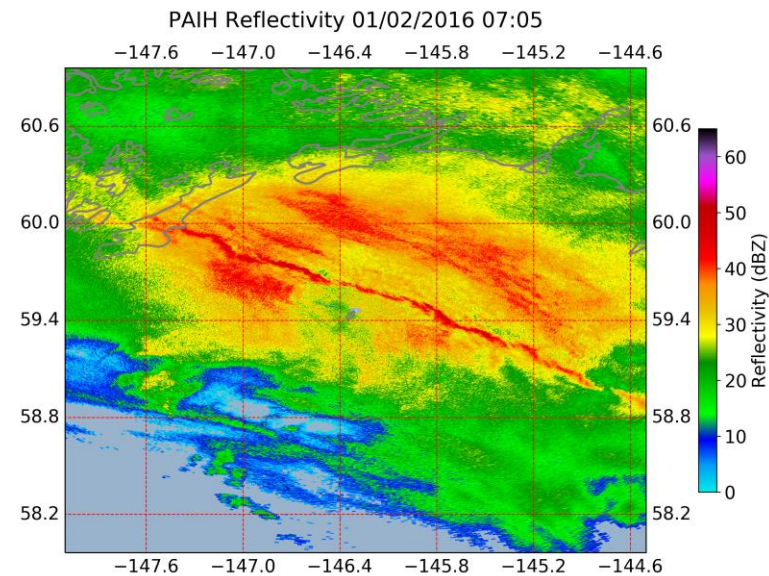


Schematic View of Case

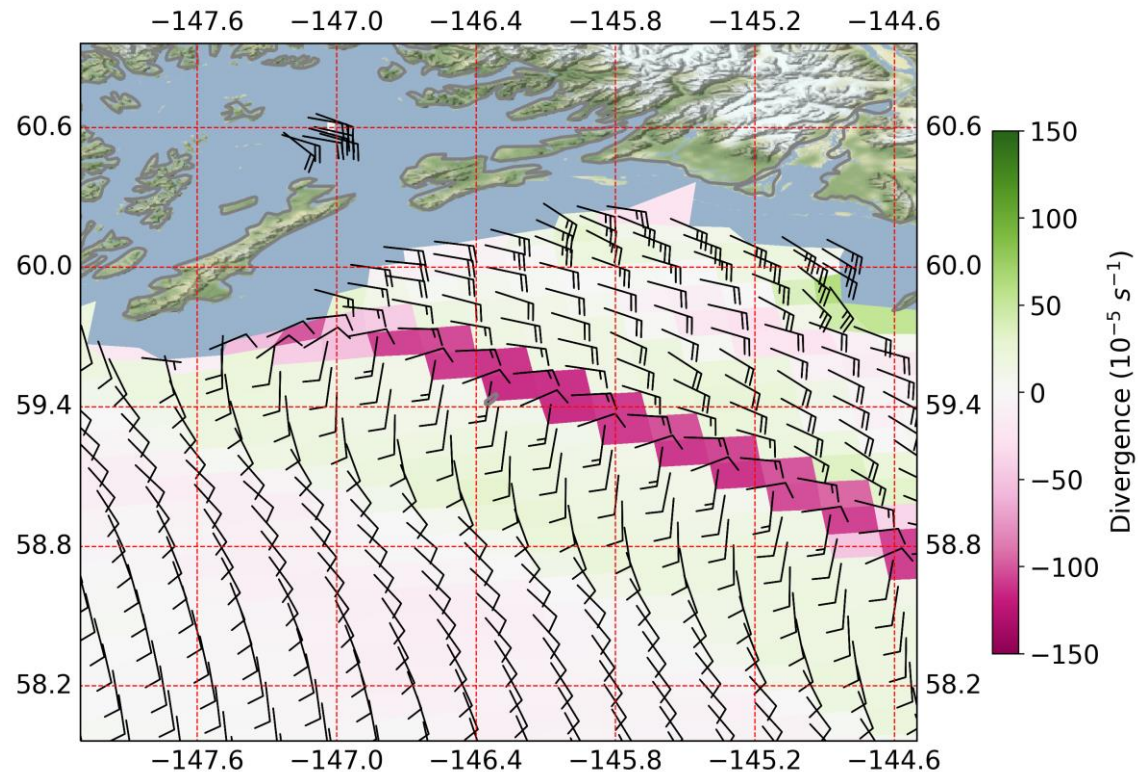


Quick look at another
case (we have many!)

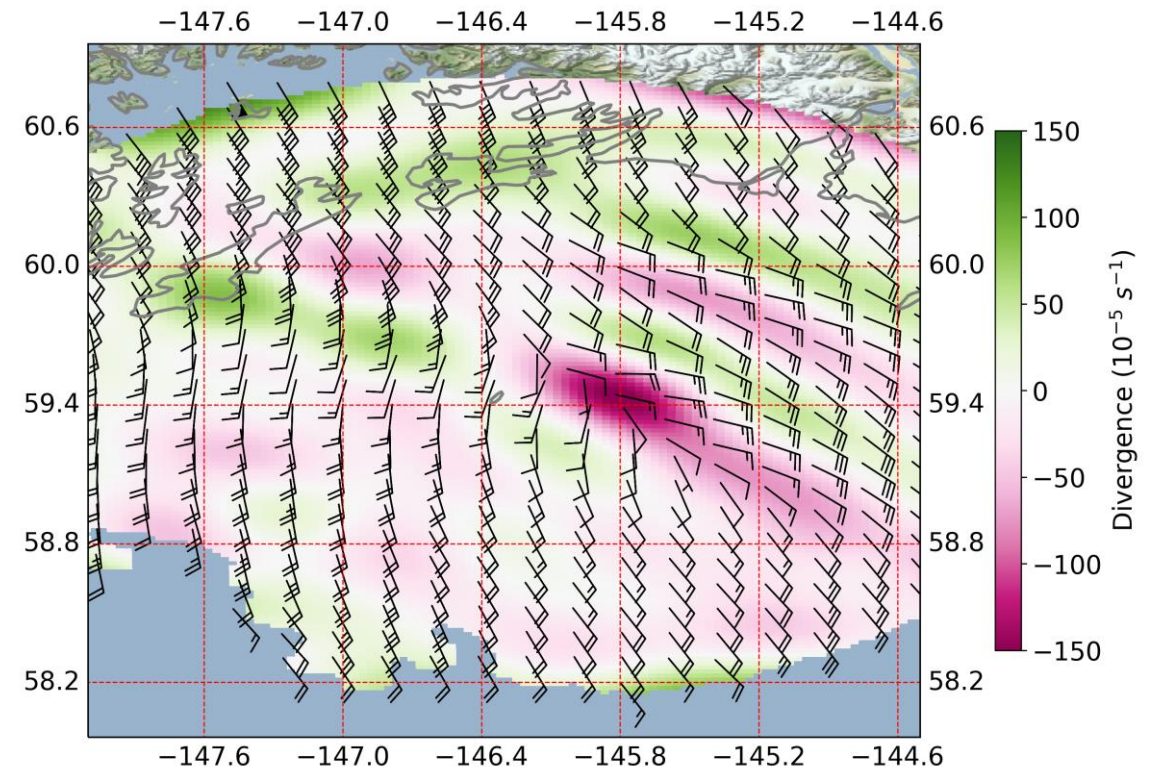
1/2/2016 near Alaska



Divergence (ASCAT-A) 01/02/2016 06:54



Divergence (PAIH) 01/02/2016 07:05



Summary

- Ground radar and scatterometer together provide an understanding of near-surface to low-level flow structures near organized convective systems
- ASCAT quality flags do not appear to correspond to consistent rain properties (e.g., rain rate, D_0 , LWP) – case/overpass dependent!
- However, if ASCAT quality flags are not set, that suggests low IWP ($< 0.5 \text{ kg m}^{-2}$) overhead

Questions? timothy.j.lang@nasa.gov